

Please add new claims 12-14 as follows:

— 12. A semiconductor device comprising a semiconductor substrate, and aluminum conductors formed on a side of a main face of the substrate which aluminum conductors comprise aluminum as a main constituent thereof, said aluminum conductors containing copper and nickel, wherein each of the aluminum conductors has at least one area in which conductor spacing is not more than $0.4 \mu\text{m}$ and wherein the content of nickel contained in said aluminum conductors is not less than 0.2 at.% but not more than 1 at.%

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13. A semiconductor device comprising:
a semiconductor substrate,
aluminum conductors formed in a plurality of layers on a side of a main face of the substrate which aluminum conductors comprise aluminum as a main constituent thereof, said aluminum conductors containing copper; and
means for suppressing diffusion of copper atoms in said aluminum conductors to prevent precipitation of the copper.

14. A semiconductor device according to claim 13, wherein said means for suppressing diffusion of copper atoms comprises nickel added to said aluminum conductors. —

REMARKS

Reconsideration and allowance of this application, as amended, is respectfully requested.

This amendment is in response to the Office Action dated July 31, 2002.

Appreciation is expressed to the Examiner for the allowance of claims 4 and 10 and the indication of allowable subject matter in claim 3. By the present amendment, claim 3 has been rewritten into independent form as new claim 12, which includes the subject matter of each of claims 1, 2 and 3. Accordingly, allowance of claim 12, in light of the indication of allowable subject matter in claim 3, is respectfully requested.

Also by the present amendment, claim 1 has been amended for clarification of the invention. Accordingly, reconsideration and allowance of amended claim 1 and its dependent claim 2 over the cited prior art to Friedman (USP 6,239,703) and Japanese Patent No. 363230845A to Kusano is respectfully requested. By the present amendment, claim 1 has been amended to clarify that the aluminum conductors formed on a side of the main surface of the substrate are formed "in a plurality of layers." In other words, the aluminum conductors in question are conductors which are formed in a plurality of layers on the chip itself, and are not bonding wires.

In the Office Action, it is recognized that Freedman "does not teach a conductor comprising aluminum as a main constituent and containing copper and nickel." However, the Office Action goes on to state in paragraph 5 at the bottom of page 2 that:

"Kusano et al teaches a conductor comprising aluminum as a main constituent and containing copper and nickel."

As such, claims 1 and 2 are rejected in the Office Action based upon the proposed modification of Friedman using the teachings of Kusano regarding a conductor comprising aluminum and containing copper and nickel.

In response to this, applicants respectfully note that the aluminum conductor

apparently being referred to in Kusano is a bonding wire used to connect a semiconductor element to an external terminal. Kusano does not teach an aluminum conductor formed in a plurality of layers on a side of the main surface of the substrate which contains copper and nickel. As such, it is respectfully submitted that amended claim 1 clearly defines over the arrangement of Kusano, and reconsideration and allowance of claim 1 and its dependent claims 2 and 3 is respectfully requested.

In addition, new claims 13 and 14 have been added to further define the invention in a means-plus-function format. In particular, as discussed on page 1 of the specification, a problem which the present invention is directed to is avoiding a precipitate containing copper in aluminum conductors which have copper added thereto to strengthen the aluminum conductors from being broken due to migration. In order to avoid this undesirable precipitation of copper, the inventors have determined that an additive can be provided to the aluminum conductor to suppress the diffusion of copper, thereby preventing the precipitation (e.g., see page 2, line 17 et seq. of the specification). As discussed beginning on page 2, line 26 et seq., nickel can serve as the appropriate additive for preventing this undesirable diffusion of copper atoms.

New independent claim 13 defines the invention in a manner similar to amended claim 1, except for replacing the limitation of nickel with the limitation of:

"means for suppressing diffusion of copper atoms in said aluminum conductors to prevent precipitation of the copper."

Claim 14 defines that this means includes nickel added to the aluminum conductors. It is respectfully submitted that Kusano fails to teach or suggest any such means for suppressing diffusion of copper atoms in aluminum conductors formed in a plurality

of layers on a main surface of the substrat . As such, it is respectfully submitted that new claims 13 and 14 clearly define over the cited prior art, including the Kusano reference, and allowance of these newly submitted claims 13 and 14 is also respectfully requested.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "Version with markings to show changes made."

If the Examiner believes that there are any other points which may be clarified or otherwise disposed of, either by telephone discussion or by personal interview, the Examiner is invited to contact applicants' undersigned attorney at the number indicated below.

To the extent necessary, the applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in the fees due in connection with the filing of this paper, including extension of time fees, to the deposit account of Antonelli, Terry, Stout & Kraus, Deposit Account No. 01-2135 (500.38949X00).

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

Claim 1 has been amended as follows:

1. (Amended) A semiconductor device comprising a semiconductor substrate, and aluminum conductors formed in a plurality of layers on a side of a main face of the substrate which aluminum conductors comprise aluminum as a main constituent thereof, said aluminum conductors containing copper and nickel.

New claims 12-14 have been added.

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